RMP Microplastic Workgroup

Wednesday, April 20, 2022
11:00 AM – 2:30 PM PDT
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AGENDA

1.	**Introductions and Goals for This Meeting** The goals for this meeting: ● Provide update on relevant microplastic scientific findings ● Provide update on relevant state activities relating to microplastics ● Obtain feedback on MPWG and Tires Strategy ● Recommend whether special study proposal should be funded by the RMP in 2022 and provide advice to enhance this proposal	11:00 Melissa Foley
2.	**Information: Microplastic Workgroup Strategy** ● Brief review of recent science and management activities on microplastics ● Review of RMP MPWG strategy Desired Outcome: Informed Workgroup. Feedback from science advisor, RMP stakeholders, participating scientists and stakeholders Meeting materials: April and Sept. 2021 RMP MPWG Summary, pages 5-22	11:10 Diana Lin

3.	**Information: California Statewide Microplastics Strategy** On February 23, 2022, the California Ocean Protection Council adopted the first Statewide Microplastics Strategy pursuant to SB 1263 (Portantino), which was submitted to the state legislature for implementation of findings and recommendations. The Statewide Microplastics Strategy was informed by recent scientific advancements and outlines multi-benefit actions the state can implement immediately, as well as state research priorities that will advance our understanding of microplastics to refine future solutions. Desired Outcome: Informed Workgroup. Meeting materials: Statewide Microplastics Strategy (link)	11:40 Kaitlyn Kailua (OPC)
	Lunch Break (20 minutes)	12:10
4.	**Information: The biological impacts of tire micro / nanoparticles and microfibers on growth and swimming behavior in coastal species, and the implications** Impacts of plastic pollution on aquatic ecosystems are widely documented, but the mechanisms by which micro and nanoplastics (< 5 mm, or < 1µm, respectively) cause sublethal toxicity across particle shapes, sizes, and polymer types remain under investigation. For example, evidence suggests that smaller sizes and certain particle shapes (e.g. fibers) cause higher toxicity than larger particles with a uniform surface (e.g. spheres). Exposures performed herein on early life stages of commonly used coastal model organisms – the Inland Silverside (Menidia beryllina) and mysid shrimp (Americamysis bahia) - indicate that sublethal responses such as altered behavior and reduced growth can vary depending on particle size and shape, as well as weathering state. This presentation will compare across recent experiments and place results in the context of current risk assessment approaches, such as species sensitivity distributions, being used to determine thresholds for microplastics in freshwater and marine ecosystems. Desired Outcome: Informed workgroup	12:30 Susanne Brander (Oregon State U.)

5.	**Information: Tires Strategy Update** Findings from the Tires Conceptual Model project, jointly funded by the OPC and RMP, identified tire wear particles generated during driving as a major source of microplastics to the Bay and globally. The final report also identified key information gaps needed to inform management of microplastics. International research addressing the connection between tires and risks to aquatic habitats is rapidly evolving, and water quality managers are eager for management actions. Within this context, the RMP funded the development of a cross-workgroup strategy ("Tires strategy") to address priority RMP stakeholder needs around tire-related pollution within the capabilities of the RMP. A short-term RMP multi-year plan to address tire-related contaminants in the Bay is in development. Desired outcome: Informed workgroup. Feedback on RMP approach to tire contaminants.	1:00 Kelly Moran
6.	**Information: Are clothes dryers a source of microplastics to the environment?** Findings from the Fibers Conceptual Model project, summarized in the report "A Synthesis of Microplastic Sources and Pathways to Urban Runoff," emphasized that while fibers are the most ubiquitous form of microplastics found globally, the major sources remain unclear. A limited number of studies suggest more fibers may be released during drying compared to washing, and that fibers from dryers may be a major source of outdoor fiber pollution. Desired outcome: Informed workgroup	1:45 Monica Arienzo (Desert Research Institute)
8.	**Discussion: Proposed Microplastic Study** The goal of this study is to assess whether dryer emissions are the dominant source of fibers to urban stormwater and the San Francisco Bay. Current scientific studies are insufficient to evaluate the relative importance of this source compared to other potential sources of fibers. Monitoring to evaluate the relative importance of dryers as a source of microplastics is important to inform local, state, and national management actions that can significantly mitigate microplastic pollution. RMP Special Studies are identified and funded through a three-step process. Workgroups recommend studies for funding to the Technical Review Committee (TRC). The TRC weighs input from all the workgroups and then recommends a slate of studies to the Steering Committee (SC). The SC makes the final funding decision.	2:00 Diana Lin

	For this agenda item, the MPWG is expected to decide (by consensus) whether to recommend the proposed study to the TRC. Desired Outcome: Recommendations from the MPWG to the TRC regarding whether the special study should be funded in 2023. Receive feedback to improve study design. Identify volunteers to help identify sampling locations and study partners. Receive recommendations on other sources of funding to implement larger study. Meeting Materials: Special Study Proposal, pages 23-X	
	Adjourn	2:30

Joint Meeting of the RMP Microplastic Workgroup and OPC Microplastics Stakeholders

April 21st, 2021 (remotely held meeting)

Meeting Summary

Advisor

Name	Affiliation/Roles	Present
Chelsea Rochman	University of Toronto	Yes

Attendees:

Adam Wong (SFEI)
Alicia Gilbreath (SFEI)
Alvina Mehinto (SCCWRP)
Amanda Roa (Delta Diablo)
Amelia Labbe (Cabrillo Community College)
Andy Gray (UC Riverside)
Anne Balis (City of San Jose)
Anne-Cooper Doherty (DTSC)
Artem Dyachenko (EBMUD)
Ashley LaBass (Bay Planning Coalition)
Autumn Cleave (SFPUC)
Barbara Baginska (SFB RWQCB)
Brian Laurenson (Larry Walker Associates)
Bryan Frueh (City of San Jose)
Carlie Herring (NOAA)
Carolynn Box (independent ocean conservation consultant)
Charles Wong (SCCWRP)
Chris Sommers (BASMAA)
Conrad MacKerron (As You Sow)
Corey Clatterbuck (SFB RWQCB)
Dawit Tadesse (SWRCB)
Deepak Mallya (The Tyre Collective)
Diana Lin (SFEI)
Don Yee (SFEI)
Emma Sharpe (Western Washington University)
Eric Dunlavey (City of San Jose)
Ezra Miller (SFEI)
Farid Ramezanzadeh (Hayward)
Heather Goss (EPA)
Heather Podoll (Fibershed)
Holly Wyer (OPC)
Jackie Doremus (Cal Poly)
Jackie Lang (UC Davis)
Jared Voskuhl (CASA)
Jasquelin Pena (UC Davis)
Jay Davis (SFEI)
Jaylyn Babitch (City of San Jose)
Jeremy Conkle (TX A&M Corpus Christi)
Jerry Kickenson (Sierra Club Grassroots Network)
Karin North (City of Palo Alto)
Kay Ho (EPA)
Kelly Moran (SFEI)
Kiya Bibby (California Ocean Science Trust)
KM Michels (Safe Healthy Playing Fields)
Krystle Moody Wood (Materevolve)
Leah Thornton Hampton (SCCWRP)
Lisa Erdle (University of Toronto)
Lisa Mondy (Sandia National Laboratories)

Luisa Valiela (EPA)
Maggie Stack (San Diego State University)
Margaret McCauley (EPA)
Mary Lou Esparza (CCCSD)
Melissa Foley (SFEI)
Miguel Mendez (SFEI)
Miriam Diamond (University of Toronto)
Molly Martin (EPA)
Monica Arienzo (Desert Research Institute)
MSmith
Olivia Angus (Surfrider Foundation)
Rebecca Sutton (SFEI)
Richard Looker (SFB RWQCB)
Richard Thompson (University of Plymouth)
Roman Berenshteyn (Bay Planning Coalition)
Roxana Suehring (Ryerson University)
Samantha Harper (SFB RWQCB)
Sarah Hutmacher (San Diego River Park Foundation)
Scott Coffin (SWRCB)
Shelly Moore (SFEI)
Shelly Walther (LA County Sanitary District)
Sherry Lippiatt (NOAA)
Simona Balan (DTSC)
Simret Yigzaw (City of San Jose)
Siobhan Anderson (The Tyre Collective)
Sriram Gopal (Association of Home Appliance Manufacturers)
Stephanie Karba (Patagonia)
Steve Weisberg (SCCWRP)
Susanne Brander (Oregon State University)
Sutapa Ghosal (CDPH)
Tan Zi (SFEI)
Tanya Torres (NOAA)
Thomas Mumley (SFB RWQCB)
Thomas Novotny (San Diego State University)
Tim Merkel (Clean Brake Performance)
Florian Pohl (University of Plymouth)
Violet Renick (Orange County Sanitation)
Wayne Landis (Western Washington University)
Win Cowger (UC Riverside)

1. Introductions and Goals for This Meeting

Melissa Foley began the meeting by highlighting remote meeting tips, reviewing the Zoom platform functionalities, and giving a land acknowledgment to the Native peoples of the San Francisco Bay Area. Melissa then introduced the Workgroup's advisor, Chelsea Rochman, and new member of the SFEI team, Kelly Moran. After a brief roll call, Melissa reviewed the day's agenda and communicated the goals for the day, emphasizing the roles of advisors, experts, and stakeholders in providing input on the OPC project as well as the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) Microplastic Workgroup (MPWG) multi-year planning and special studies.

2. Discussion: Tire Wear Stormwater Conceptual Model Update (RMP & OPC)

Diana Lin introduced the item by reviewing the past efforts of the Workgroup, focusing on the findings from the San Francisco Bay Microplastic Study. She highlighted the important discovery of stormwater as a significant pathway for microplastics, which were evenly composed of fibers and fragments. She continued by detailing next steps aimed at informing management actions, particularly the development of four stormwater conceptual models synthesizing the current understanding of terrestrial microplastic sources and pathways to urban stormwater. She noted that draft conceptual models, funded by the OPC, for cigarette butts and cellulose acetate fibers, fibers (other than cellulose acetate), and single-use plastic foodware (SUPF) would be

presented later in the meeting. Diana gave an overview of the project timeline and important terminology related to the models, including primary and secondary microplastics, degradation, and deterioration. She then introduced Kelly Moran to discuss the tire wear stormwater conceptual model funded by the RMP.

Kelly presented the current status of the conceptual model, an RMP special study in its second year. The focus of the conceptual model work has been on tire particles because they were the most common type of microplastic entering San Francisco Bay. Kelly highlighted the importance of viewing tire particles as both microplastics and chemical carriers, as illustrated by evidence implicating a tire-related toxicant in the pre-spawn mortality of coho salmon in the Pacific Northwest. She discussed the size distribution of tire wear particles, their large surface area for leaching contaminants, and their pathways of release into the environment. Kelly then presented the diagram of the conceptual model, walking through the various sources and pathways for tire wear particles to reach stormwater runoff, including the long-range transport via air and short-range transport to land surfaces. She continued by introducing the tire particle mitigation options diagram, emphasizing the variety of available mitigation measures that could be implemented by various key players, including tire and vehicle manufacturers, government entities, and the general population. She reviewed the many data gaps remaining, including management-relevant data gaps in the areas of environmental monitoring, fate and transport, and mitigation, a subset of which are potential near-term priorities for the RMP.

Kelly posed a few questions to the meeting participants asking for input on the conceptual models and data gap priorities. The group discussed the nuances of the separation of tire particles from environmental samples, with Chelsea Rochman noting the importance of understanding that road material is likely attached to many tire particles, thus increasing their density. Kelly remarked that there is variability in processes for formation of tire particles across the tire particle size distribution, which makes particle surface area difficult to estimate. Meeting participants provided comments on the conceptual model, recommending it show the gradient of surfaces from pervious to impervious surfaces rather than two distinct categories and suggesting clarification of whether stormwater treatment types other than bioretention may be effective for removing tire particles before stormwater enters the Bay.

3. Information: Tire Wear Debris Collection to Mitigate Pollution (RMP)

Siobhan Anderson presented on the novel work developed by The Tyre Collective (TTC), a clean technology start-up dedicated to collection of tire wear debris, where she is the Chief Science Officer and lead of research and testing. She discussed the innovative technology created to collect tire wear at the source, highlighting its capture of roughly 60% of airborne particles, and recycling of captured particles. In the short term, these devices can be retrofitted to cars, though over time they could be integrated into all vehicles. Siobhan highlighted TTC's current efforts to understand how particles are created as well as future TTC partnerships to support work to characterize particles in air (with Imperial College London) and proposed partnerships with SFEI, UC Davis, and University of Washington to characterize tire-wear particles generated in the TTC product development process.

After outlining the timeline of the product launch, Siobhan asked the group for questions. Win Cowger remarked about the density distribution of produced tire wear particles, which Siobhan says is an area of interest TTC is working on studying. Win also mentioned the potential to obtain samples from TTC would be of great help for current studies with SFEI and others (especially in creating standards). Siobhan and Deepak Mallya (Chief Product Officer at TTC) indicated interest in sharing samples and developing a library of living data with chemical and overall particle data. Richard Looker asked if the current fluid dynamics testing would improve understanding of tire wear behavior in varying conditions (i.e., dry, wet, wind conditions, and overall climate). Siobhan noted further testing in wind tunnels to understand particles dynamics, and wet surfaces, though there is not yet full understanding of the impacts of different climate conditions on their tire particle collection system.

4. Discussion: California Urban Stormwater Conceptual Models, Part 1 (OPC)

Ezra Miller presented the cigarette filters and cellulose acetate conceptual model, the first of three OPC funded California urban stormwater conceptual models that were discussed at this meeting. Ze went through the conceptual model diagram, first highlighting the relatively quick deterioration of cigarette butts and release of cellulose acetate fibers and other associated contaminants. Ezra also noted important pathways, including improper disposal via littering, further release into aquatic environments through stormwater runoff, and proper disposal through waste management. Ze also presented a draft management options model, specifying important actions, from remediation to prevention, of tobacco manufacturers, government, and the general population.

Ezra provided discussion questions to garner feedback on the content and composition of the urban stormwater and mitigation options conceptual models. Meeting participants commented on research data gaps, particularly on discernment of cellulose from cellulose acetate and toxicity studies for cigarette butt leachate. Several in the group also discussed the impact and effectiveness of collection programs, including street sweeping (with Chris Sommers noting availability of some data that shows street sweeping is more effective for macrotrash, especially because most cigarette butts are littered on sidewalks). Jackie Doremus also noted the expansion of government actions and that it may be better to identify population-wide actions as community-wide, non-governmental actions.

Kelly Moran then presented the fibers conceptual model (excluding cellulose acetate), beginning by identifying the variety of indoor and outdoor fiber sources. She emphasized the unique transmission pathways of fibers from source to stormwater, especially air transport that is possible due to the small size and weight of fibers and their elevated, heated air emission from tumble dryer vents. She continued by noting the remaining data gaps in understanding fiber releases and pathways, including from tumble dryers and construction sites.

Kelly posed some questions regarding the importance of the construction pathway and to provide input on the conceptual model substance and design. The meeting participants noted modeling would be useful to understand air transport of fibers. Several also commented on

remaining data gaps, including understanding emissions from wearing clothes and homeless encampments as a source. Sutapa Ghosal asked about the potential differences of fibers from dryers versus from clothing dried on the line, with Kelly mentioning line-dried clothing is expected to not lose fibers quickly, though with current data gaps, estimating the relative loads from different sources is a challenge.

5. Discussion: California Urban Stormwater Conceptual Models, Part 2 (OPC)

Shelly Moore and Miguel Mendez presented the SUPF stormwater conceptual model. Shelly began by defining SUPF and identifying its urban sources, highlighting the mismanagement of SUPF predominantly through littering. She further noted current actions in California to curb waste from SUPF and trash overall, featuring a Southern California study showing a decrease of plastic bag waste in areas with a plastic bag ban in effect. Miguel continued by identifying important terms in the breakdown of SUPF to secondary microplastics, focusing on the mechanisms of deterioration, including photooxidation, mechanical breakdown, and biodegradation. He discussed the qualitative summary table of the characteristics of deterioration and degradation to focus the conceptual model on land-based sources, where secondary microplastics are most likely to form. Miguel then presented the diagram of the conceptual model, summarizing the sources and pathways discussed throughout the presentation.

Miguel provided discussion questions to ask for input on the content and design of the conceptual model. Meeting participants discussed the need to better understand the types of materials used and connection to sources, especially linking secondary microplastics to large macroplastic items/sources. Roxana Suehring noted a potential collaboration opportunity in a project to map microplastics to macroplastics based on forensic analysis. The group also noted suggested changes to the conceptual model diagram, including broadening of sources beyond urban commercial/residential areas and potential inclusion of highway trash.

6. Summary: OPC Project Discussion Wrap-Up and Next Steps (OPC)

Diana Lin briefly reviewed the California urban stormwater conceptual models and wrapped up any remaining discussion topics. She ended this section of the meeting by reiterating the project timeline, emphasizing important dates for participants to provide feedback on the draft versions of the project. She requested attendees to send any additional comments via email by April 30. No additional comments were received via email.

7. Information: Update on Ecological Health Effects of Microplastics in Water: Characterizing Current Knowledge and Identifying Research Priorities (RMP)

Dr. Susanne Brander from Oregon State University presented on current ongoing efforts related to risk and toxicological assessment of microplastics in California. She discussed the exponentially growing research on plastics, highlighting the importance of size and shape while noting the development of a database of studies, Toxicity of Microplastics Explorer (ToMEx), that

will be available later in 2021. Dr. Brander detailed the current state-level actions, beginning with the Ocean Science Trust Science Advisory Panel that has developed a qualitative risk prioritization framework with a report available at the end of April. She continued by talking about the Microplastics Health Effects Workshop, coordinated by SCCWRP and The State Water Board (SWB) with the RMP providing some support funding, and presented draft tiered microplastic thresholds for ambient waters and associated suggested management actions. Dr. Brander mentioned next steps, including derivation of ambient and human health thresholds, consensus building on the overall management framework, and plans for recommendations for additional research and monitoring.

Meeting participants commented on the role of different considerations (integration of chemicals in particles, size, morphology, and polymer type) within the risk assessment, which Dr. Brander noted are a part of ongoing discussions, though data availability is fairly limited. Wayne Landis asked about the highest priority topics to reduce the uncertainty of the analysis; Dr. Brander responded that the largest data gaps are fibers, tire wear particles, and targeted studies on these plastic types (i.e., toxicity and presence in the environment). Richard Looker remarked that species sensitivity distributions using lowest observable effect concentrations (LOECs) would be valuable as a part of the analysis. Dr. Brander mentioned that the SWB is currently working on developing LOECs and that no observable effect concentrations (NOECs) were chosen to be conservative and consistent with the SWB.

8. Information: Microplastic Risk Assessment for San Francisco Bay (RMP)

Emma Sharpe, a Masters student at Western Washington University, presented on the microplastic risk assessment for SF Bay, a collaborative effort with SFEI supported with funding from the RMP Microplastic Strategy and a National Science Foundation grant. Emma presented the Bayesian Network relative risk model, describing the overall approach to its development. She noted the current selection of endpoints (including key marine species and human health) and development from conceptual model to Bayesian Network to ultimately calculate and communicate risk. She mentioned sources of uncertainty in the analysis and concluded by noting results are expected in the summer of 2021.

Meeting participants asked technical questions, including Dr. Chelsea Rochman on the value of using the amount ingested versus the amount available for exposure in the environment within this model. Emma responded that both could be included, with Dr. Rochman adding the potential to survey the literature and use data related to its lifetime in the gut of the species in this study. Diana Lin also inquired about the utility of inclusion of invertebrates, or similar species lower on the food chain, as an additional endpoint. Emma noted this is a good idea, with Wayne Landis adding that the current endpoints are based on possible management decisions. Jay Davis suggested it is difficult to tie endpoints to decision making due to remaining questions on priority decision in microplastics. Jay also mentioned other species that may be beneficial as endpoints, especially steelhead trout due to their presence in the Bay and nexus with potential tire particle toxicity (as they are closely related to coho salmon).

9. Discussion: Microplastic Workgroup Multi-Year Plan and Future Work (RMP)

Melissa Foley introduced this item with an overview of the RMP, outlining the program objectives and budget allocations related to special studies across workgroups. Diana Lin continued with discussion of current efforts within the MPWG, including stormwater conceptual model development and an EPA-funded project on green stormwater infrastructure monitoring, as well as collaborations with projects led by other interest/science groups and academia such as the ecological health effects workshop with SWB and SCCWRP. She also spotlighted the MPWG's continued focus on informing management actions, particularly through studying transport, and noting the momentum and motivation at the local and state level to find solutions to mitigate microplastic pollution. Diana further mentioned potential near-term priorities (next five years) within the Multi-Year Plan, including tire wear strategy and particle analysis (2022) as well as air (2023), stormwater (2024), and ambient Bay monitoring (2025).

Meeting participants discussed the prospective priorities and objectives of the MPWG, with an overall consensus to continue discourse in the future after a late summer update via email on current status of projects and deliverables. They recognize the importance of having a strategy that can track other efforts and identify data gaps that need to be filled, even if funding for all work is not provided by the RMP. In particular, Dr. Chelsea Rochman expressed approval for the tire strategy and air monitoring, though questioned the exclusion of agricultural runoff (potential relationship to Bay RMP) and earlier monitoring in the ambient Bay waters. Steve Weisberg and Holly Wyer noted interest in air monitoring, with the latter also noting the soon to be released OPC priorities to further inform monitoring and OPC's intention to perform a microplastics inventory. Wayne Landis suggested performing a multi-stressor risk assessment, including chemical contaminants, to build on previous risk assessment efforts motivating sustained monitoring. Barbara Baginska noted a need for continued examination of current findings and available information, as well as further consideration of how to use this knowledge to manage water quality within the RMP and Regional Water Board. Richard Looker questioned if the focus should be on sources rather than on understanding risk and potential for harm in the Bay first.

10. Discussion: Microplastic Proposals for 2022 (RMP)

Kelly Moran briefly outlined each of the proposed studies (RMP Tires Strategy and Tire Particle/Contaminant Fate and Transport), noting the motivation for each along with the associated budgets and deliverables. After explaining each proposal, meeting participants were given a chance to ask questions and discuss topics with proposal authors prior to the closed session.

After reviewing the RMP Tire Strategy proposal, including early release of some funding ($10,000), meeting participants discussed the proposed budget including funding of workgroup meetings and updates as projects cross multiple workgroups. Dr. Chelsea Rochman asked about the scope of broader outreach efforts related to workgroup meetings to help build the strategy, with Kelly noting a focus on California (Bay Area) related stakeholders to inform management actions. Presentation of the tire particle/contaminant fate and transport proposal

elicited a few comments, with Dr. Rochman remarking about the potential use of passive air samplers and chemical confirmation of rubber particles. Kelly Moran commented that current passive air samplers do not allow for direct collection of the full size range of tire wear material and chemical confirmation is important, though costly and currently outside of the budget.

11. Closed Session - Decision: Recommendations for RMP 2022 Special Studies Funding

The results of the discussions are shown in the following prioritization table.

Study Name	Budget	Priority	Comments
Tires Strategy	$25,500	1	Refocus strategy on chemical impact to Bay rather than fate and transport
Tire Particle/ Contaminant Fate and Transport	$110,000	SEP list	This is important work, but is maybe too early for the RMP without knowing the level of risk for the Bay from tire contaminants and particles. Add to the SEP list. Could reduce the budget by focusing on one type of particle (Tyre Collective or roadway collections) that is most environmentally relevant.

12. Report Out on Recommendations

After the closed door session, proposal authors were invited back to the meeting to hear the final prioritization decisions. Eric Dunlavey summarized the discussed suggestions and recommendations. Jay Davis highlighted future updates and further discussion through email and a formal meeting (funds permitting) in late summer/early fall.

Adjourn

About the RMP

RMP ORIGIN AND PURPOSE

In 1992 the San Francisco Bay Regional Water Board passed Resolution No. 92-043 directing the Executive Officer to send a letter to regulated dischargers requiring them to implement a regional multi-media pollutant monitoring program for water quality (RMP) in San Francisco Bay. The Water Board's regulatory authority to require such a program comes from California Water Code Sections 13267, 13383, 13268 and 13385. The Water Board offered to suspend some effluent and local receiving water monitoring requirements for individual discharges to provide cost savings to implement baseline portions of the RMP, although they recognized that additional resources would be necessary. The Resolution also included a provision that the requirement for a RMP be included in discharger permits. The RMP began in 1993, and over ensuing years has been a successful and effective partnership of regulatory agencies and the regulated community.

The goal of the RMP is to collect data and communicate information about water quality in San Francisco Bay in support of management decisions.

This goal is achieved through a cooperative effort of a wide range of regulators, dischargers, scientists, and environmental advocates. This collaboration has fostered the development of a multifaceted, sophisticated, and efficient program that has demonstrated the capacity for considerable adaptation in response to changing management priorities and advances in scientific understanding.

RMP PLANNING

This collaboration and adaptation is achieved through the participation of stakeholders and scientists in frequent committee and workgroup meetings (see Organizational Chart, next page).

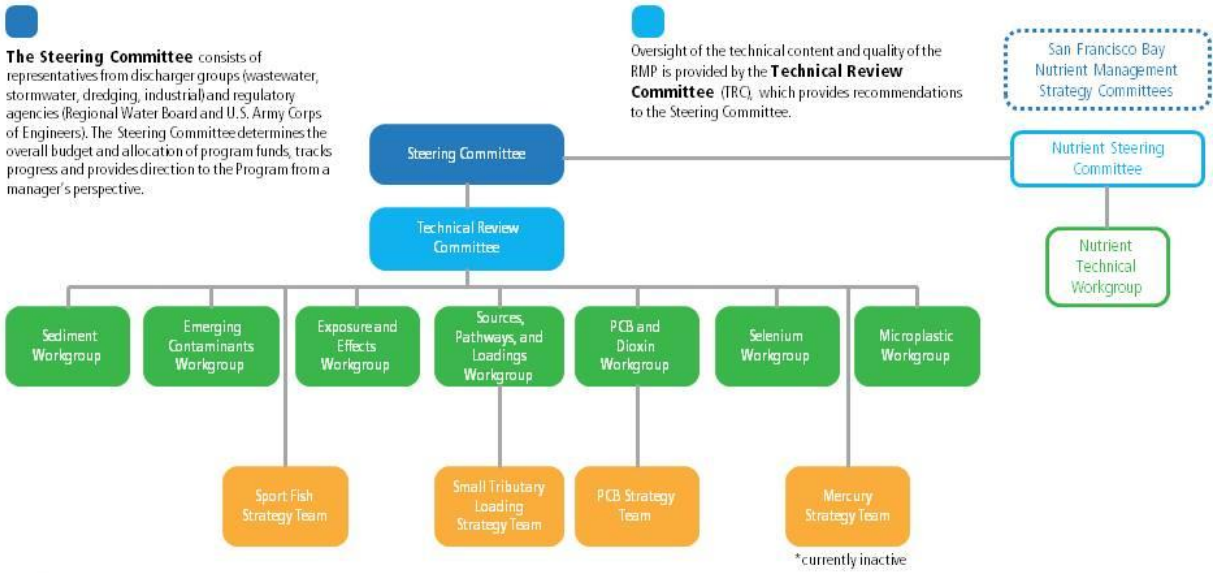
The annual planning cycle begins with a workshop in October in which the Steering Committee articulates general priorities among the information needs on water quality topics of concern. In the second quarter of the following year the workgroups and strategy teams forward recommendations for study plans to the Technical Review Committee (TRC). At their June meeting, the TRC combines all of this input into a study plan for the following year that is submitted to the Steering Committee. The Steering Committee then considers this recommendation and makes the final decision on the annual workplan.

In order to fulfill the overarching goal of the RMP, the Program has to be forward-thinking and anticipate what decisions are on the horizon, so that when their time comes, the scientific knowledge needed to inform the decisions is at hand. Consequently, each of the workgroups and teams develops five-year plans for studies to address the highest priority management questions for their subject area. Collectively, the efforts of all these groups represent a substantial body of deliberation and planning.

PURPOSE OF THIS DOCUMENT

The purpose of this document is to summarize the key discussion points and outcomes of a workgroup meeting.

Governance Structure for the Regional Monitoring Program for Water Quality in San Francisco Bay



RMP Microplastic Workgroup Fall Meeting
September 27th, 2021 (remotely held meeting)

Meeting Summary

Advisor

Name	Affiliation/Roles	Present
Chelsea Rochman	University of Toronto	Yes

Attendees:

Alicia Taylor (DTSC)
Alvina Mehinto (SCCWRP)
Artem Dyachenko (EBMUD)
Barbara Baginska (SFB-RWQCB)
Chris Sommers (BASMAA)
Diana Lin (SFEI)
Dicle Yardimci (DTSC)
Eric Dunlavey (City of San Jose)
Ezra Miller (SFEI)
Jennifer Dyment (BACWA)
Justine Kimball (OPC)
Karin North (City of Palo Alto)
Kelly Moran (SFEI)
Leah Hampton (SCCWRP)
Lorien Fono (BACWA)
Luisa Valiela (EPA)
Martin Trinh (SFEI)
Mary Lou Esparza (CCCSD)
Miguel Mendez (SFEI)
Rebecca Sutton (SFEI)
Robert Brushia (EPA)
Robert Wilson (City of Santa Rosa/BAPPG)
Ryan Batijiaka (SFPUC)
Scott Coffin (SWRCB)
Simona Balan (DTSC)
Valerie Hanley (DTSC)
Xin Xu (EBMUD)

1. Introductions and Goals for This Meeting

Rebecca Sutton began the meeting by highlighting remote meeting tips, reviewing the Zoom platform functionalities, and giving a land acknowledgment to the Native peoples of the San Francisco Bay Area. Rebecca then introduced the Workgroup's advisor, Dr. Chelsea Rochman. After a brief roll call, Rebecca reviewed the day's agenda and communicated the goals for the meeting, providing an update on related projects and emphasizing the roles of advisors and stakeholders in providing input on the future directions of the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) Microplastic Workgroup (MPWG).

2. Information: Microplastic Workgroup Multi-Year Plan and Future Work

Rebecca Sutton introduced the item by reviewing the recent classification of microplastics as Moderate Concern for the Bay under the RMP's CECs tiered risk-based framework. The CEC Strategy recommends monitoring the Bay and investigating sources and pathways to inform pollution prevention management actions. She also noted the five priority management questions driving the MPWG, highlighting further discussion in the last agenda item to gather consensus on the highest priority question(s) to inform the MPWG Multi-Year Plan (MYP).

3. Information: Health-based Microplastics Thresholds for Ambient Waters

Dr. Alvina Mehinto from the Southern California Coastal Water Research Project (SCCWRP) presented the health-based thresholds for microplastics in ambient waters developed by the Microplastics Health Effects Workshop. SCCWRP and the University of Toronto led the series of workshops in coordination with the California Water Resources Control Board and the California Ocean Protection Council (OPC), with funding from the RMP for Ezra Miller to participate. The purpose of the workshop was to synthesize current knowledge of human and aquatic organism health effects of microplastics in water to develop health-based thresholds.

Alvina described the overall approach to the development of thresholds, beginning with a tiered management framework (adapted from the model used by the State of California to monitor CECs) to assess microplastics in ambient waters. She continued by walking through the progression of management steps for each tier: (1) investigative monitoring, (2) discharge monitoring, (3) management planning, and (4) source control measures. The expert workshop derived thresholds using Species Sensitivity Distributions (SSDs), a well-known statistical approach used to summarize the sensitivity of different species to the same stressor and set safety limits. A thorough screening of available toxicity data, following specific QA criteria, identified a small subset of studies (22 of 167 studies) with usable data for this analytical approach. She highlighted the challenges of working with this dataset, including the importance of size in determining species effects, limited data not reflecting the breadth of microplastics shapes or polymers, and difficulty of comparison requiring a modeling approach to align data.

Alvina then presented the derived thresholds for each management step for two modes of action: food dilution (particle size 1-500 µm) and translocation (particle size 1-83 µm). Experts have high confidence in the framework and approach and are currently evaluating the confidence level of derived values. Further, sensitivity analyses determined that modeling and analytical assumptions had minimal impact on the derived thresholds, though the endpoint selection is essential. She ended by noting recommendations to increase confidence in the derived thresholds, including improved understanding of adverse outcome pathways (to support the selection of appropriate endpoints), further inclusion of data from environmentally relevant exposure scenarios (size, shape, and polymer type), and more dose-response data (to understand effect concentrations better).

Meeting participants asked questions, including Chris Sommers, who inquired about the project's status. Alvino noted that findings are included in several manuscripts, which will be submitted for peer review by the end of the month. Ezra Miller, who is a co-author, noted that the RMP would review the manuscripts concurrently with the journal's peer-review process. In addition, Chris asked about the current state of active dose-response studies separating the types of microplastics. Chelsea Rochman highlighted the work of Dr. Susanne Brander of Oregon State University as potentially fitting within this category, with Dr. Scott Coffin adding that there are also ongoing projects in Canada and Europe. The discussion then continued onto the scope of the studies, specifically if many differentiated between the effects of chemistry and physical structure. Chelsea Rochman mentioned that several studies are attempting this, though there are several complexities to fully understanding the effects. Alvina clarified that these thresholds were developed considering only the effects of particles and did not include impacts from chemicals in microplastics.

4. Information: Preliminary Comparison of Ecotoxicological Thresholds to Microplastics Occurrence Data in San Francisco Bay

Dr. Scott Coffin from the State Water Resources Control Board (SWRCB) presented a preliminary risk characterization based on microplastic occurrence data in San Francisco Bay and derived ecotoxicological thresholds for aquatic organisms presented earlier by Dr. Alvina Mehinto. This project is motivated by California Senate Bill 1263: Statewide Microplastics Strategy to develop a risk assessment framework by 2026. He gave an overview of the analytical methods to align available microplastic occurrence data (generally larger particle sizes) and laboratory effects data (generally smaller particle sizes). This analytical method assumes a power-law distribution of particle sizes in each type of environment and uses the particle characteristic distributions to calculate microplastic concentrations for particle sizes that were not sampled. He highlighted the size, shape, and density probability distributions as the most important to accurately align the data while also noting that these distributions are distinct for each aquatic compartment (i.e. biota, effluent, sediments, surface waters). The particle size distribution and calculated correction factors are based on data from the Netherlands with no available Bay-specific data.

Scott continued with a discussion of the application of this approach to the blank-corrected SF Bay microplastics monitoring data. The occurrence data were aligned by matrix (stormwater, surface water, and wastewater), with the highest occurrence concentrations shown in stormwater. The surface water samples collected using the Manta trawl and 1-L grab samples did not align, indicating some type of bias in sampling or inaccuracy in the distributions used to align the data. The overall aligned data concentrations in San Francisco Bay are generally lower than those found for global oceans and similar to those in global freshwaters. Further, compared to the draft thresholds, both the aligned and unaligned SF Bay data show some samples with exceedances for all four levels of derived thresholds. Only about 25% of aligned data fell below the lowest management tier threshold, and less than 1% of aligned data would exceed the threshold for the highest management tier, indicating there are likely very few samples with no risk to sensitive species. Scott also spotlighted the use of the Tomex App, which is planned to be a continuously updating database of occurrence and ecotoxicological data and allows users

to develop SSDs and derive thresholds in a similar way to those developed by the Microplastics Health Effects Workshop. He concluded by noting ways to improve the risk characterization in SF Bay, including improved understanding of site-specific species effects and determining the particle size distributions specific to the Bay with depth-integrated monitoring and standardized sampling and analytical methods.

Several meeting participants discussed the inclusion of wastewater and stormwater data in the risk characterization because wildlife is not necessarily directly exposed to these matrices. Chelsea Rochman also noted that the difference in data from sampling apparatuses in surface water could be due to additional quantification of fibers in 1-L grab samples (which was not done for manta trawl samples). Luisa Valiela commended this work and its accessibility to experimenting with available data, recommending further sharing once it becomes available after manuscript publication. Barbara Baginska inquired about the species present in the analysis, including which are the most sensitive, the applicability of these thresholds for the Bay, and the next steps for the study. Scott replied that a fish (Medaka) is the most sensitive species in the SSDs developed by the workshop, though no single taxa are necessarily considered the most sensitive. He also added that the current data is not tailored to the Bay, requiring further site-specific data to improve thresholds aligning with the environmental reality in the Bay. Kelly Moran noted that for chemicals, such as pesticides, SSDs using surrogate indicator species to derive thresholds are widely accepted and widely used for regulatory purposes. This raises questions about the need for Bay-specific species toxicity data to understand the potential impacts of microplastics on the Bay. Chris Sommers noted the overall importance and value of MPWG meetings like today in providing a forum and opportunity for RMP stakeholders to learn and discuss new microplastic data and tools.

5. Information: Recommendations from California Stormwater Conceptual Model Synthesis

Diana Lin briefly reviewed the Microplastic Stormwater Conceptual Models project funded by the OPC, highlighting the key themes and recommendations from the soon-to-be-published final report. She noted the development of four conceptual models for cigarette filters (and cellulose acetate), fibers (except cellulose acetate), tires, and single-use plastic foodware to inform the sources and pathways of microplastics in urban stormwater and potential management actions. As an example, she walked through the fibers conceptual model, identifying the wide range of potential indoor and outdoor sources. In particular, Diana identified air transport as an important pathway. Further study is required to understand major sources, including fiber emission from tumble dryers and dryer vents used predominantly in the US and Canada. She also noted that the overall long-range transport of microplastics from global and legacy sources could also be a significant pathway for microplastics to enter the Bay watershed. A recent global atmospheric study suggests that continents (especially coastal cities and areas) may be net importers of microplastics from the ocean.

Further, she spotlighted the importance of viewing microplastics as chemical carriers, as illustrated by evidence implicating a tire-related toxicant in the pre-spawn mortality of coho salmon in the Pacific Northwest. Microplastics may play a crucial role in transporting and

releasing plastic ingredients and additives, many of which are priority contaminants for the RMP and ECWG (e.g., bisphenols, organophosphate esters, PFAS), into the Bay. Diana then presented the cigarette filter mitigation options diagram to demonstrate the range of actions from prevention to remediation to mitigate the release of microplastics and related chemicals. The diagrams exemplify the broad range of mitigation opportunities and needed engagement across key players, including manufacturers/industry, government entities, and the general population.

6. Discussion: Microplastic Workgroup Multi-Year Plan (MYP) and Future Work

Diana Lin briefly reviewed the MPWG MYP, highlighting the four main elements: strategy; Bay monitoring; characterization of sources, pathways, and loadings processes; and characterization of particles and related chemicals. She particularly detailed the importance of strategy funds to maintain engagement in the field and leadership in ongoing science and policy discussions. She continued by noting current collaborations and external funding opportunities to support informing understanding of microplastics in the Bay. She concluded by opening the floor for discussion on prioritization of the management questions (MQs) to help guide future directions of the RMP MPWG.

MQ1: How much microplastic pollution is in the Bay?
MQ2: What are the health risks?
MQ3: What are the sources, pathways, loadings, and processes leading to microplastic pollution in the Bay?
MQ4: Have the concentrations of microplastics in the Bay increased or decreased?
MQ5: What management actions could be effective in reducing microplastic pollution?

Chelsea Rochman began the discussion with an assessment of the uncertainty of the presented studies, noting high confidence in the risk framework with a need for more toxicity data to improve the uncertainty of the derived thresholds. She emphasized building on previous studies to further understand and develop the distribution of microplastics in the Bay to advance knowledge of exposures and associated risks. Barbara Baginska remarked that more time is needed before the RMP prioritizes microplastic studies, as more evidence is required to identify notable impacts to the Bay, and because it would be strategic to wait for statewide microplastic efforts to be presented, markedly the OPC strategy for the state on microplastics. Justine Kimball mentioned that the strategy's contents are very much in development, with a new project manager for microplastics being hired to fill the position Holly Wyer left. She also noted that Mark Gold, Executive Director of OPC, supports continued work through the RMP, especially for MQ# 2, 3, and 5. Luisa Valiela underscored the importance of MQ #2 and the need for an irrefutable body of literature on the harmful impacts of microplastics on wildlife and humans before regulatory agencies can fully engage and take action on microplastics. Chelsea Rochman commented that microplastics have known health effects; the framework needs to be fine-tuned to understand the health effects better.

Chris Sommers recommended focusing on MQ# 3 and noted that emphasis on MQ# 1 correlates well with the studies presented today to understand risk better. He also noted support

for some RMP funds for the MPWG for limited and focused efforts to keep Bay Area regulators and stakeholders engaged as the subject continues to expand quickly. Scott Coffin added that a small sampling effort would be sufficient to characterize particle size distributions in the Bay to refine his presented risk characterization. Ryan Batjiaka emphasized the importance of MQ #5 as the guiding question for all microplastic investigations. Chris Sommers noted the importance of source control actions. Several participants from the DTSC spotlighted the importance of MQ #3 and the current difficulties in thinking about how to regulate MPs, as DTSC typically regulates consumer products.

After a poll, Rebecca Sutton summarized the consensus from the meeting participants that the highest priority questions for the MPWG are MQ #3, followed by #1, with MQ #5 and MQ #2 being background motivation questions.

Adjourn

About the RMP

RMP ORIGIN AND PURPOSE

In 1992 the San Francisco Bay Regional Water Board passed Resolution No. 92-043 directing the Executive Officer to send a letter to regulated dischargers requiring them to implement a regional multi-media pollutant monitoring program for water quality (RMP) in San Francisco Bay. The Water Board's regulatory authority to require such a program comes from California Water Code Sections 13267, 13383, 13268, and 13385. The Water Board offered to suspend some effluent and local receiving water monitoring requirements for individual discharges to provide cost savings to implement baseline portions of the RMP, although they recognized that additional resources would be necessary. The Resolution also included a provision that the requirement for a RMP is included in discharger permits. The RMP began in 1993, and over the ensuing years, has been a successful and effective partnership of regulatory agencies and the regulated community.

The goal of the RMP is to collect data and communicate information about water quality in San Francisco Bay in support of management decisions.

This goal is achieved through a cooperative effort of a wide range of regulators, dischargers, scientists, and environmental advocates. This collaboration has fostered the development of a multifaceted, sophisticated, and efficient program that has demonstrated the capacity for considerable adaptation in response to changing management priorities and advances in scientific understanding.

RMP PLANNING

This collaboration and adaptation are achieved through the participation of stakeholders and scientists in frequent committee and workgroup meetings (see Organizational Chart, next page).

The annual planning cycle begins with a workshop in October in which the Steering Committee articulates general priorities among the information needs on water quality topics of concern. In the second quarter of the following year, the workgroups and strategy teams forward recommendations for study plans to the Technical Review Committee (TRC). At their June meeting, the TRC combines all of this input into a study plan for the following year that is submitted to the Steering Committee. The Steering Committee then considers this recommendation and makes the final decision on the annual workplan.

In order to fulfill the overarching goal of the RMP, the Program has to be forward-thinking and anticipate what decisions are on the horizon so that when their time comes, the scientific knowledge needed to inform the decisions is at hand. Consequently, each workgroup and team develops five-year plans for studies to address the highest priority management questions for their subject area. Collectively, the efforts of all these groups represent a substantial body of deliberation and planning.

PURPOSE OF THIS DOCUMENT

The purpose of this document is to summarize the key discussion points and outcomes of a workgroup meeting.

Governance Structure for the Regional Monitoring Program for Water Quality in San Francisco Bay